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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/807,932	03/23/2004	Qingqiao Wei	200314202-1	5174

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INTELLECTUAL PROPERTY ADMINISTRATION  
FORT COLLINS, CO 80527-2400

EXAMINER
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WHITE, DENNIS MICHAEL

ART UNIT	PAPER NUMBER
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1797

NOTIFICATION DATE	DELIVERY MODE
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10/01/2008

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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<b>Office Action Summary</b>	<b>Application No.</b> 10/807,932	<b>Applicant(s)</b> WEI, QINGQIAO	
	<b>Examiner</b> DENNIS M. WHITE	<b>Art Unit</b> 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 29 July 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-3,6-10,13-32 and 56-59 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3,6-10,13-32 and 56-59 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>07/07/2008,07/07/2008</u> .                                   | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### *Response to Amendment*

1. Applicant's amendment filed on 07/29/2008 has been noted. Claims 1, 3, 6-8, and 10 are amended; Claims 56-59 are new; Claims 4-5, 11-12, and 33-55 are cancelled. Currently claims 1-3, 6-10, 13-32, and 56-59 are pending.

### ***Claim Rejections - 35 USC § 102/103***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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5. Claims 1-2, 6-10, 13-24, 56-59 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Kendall et al (USP 6,509,619, hereinafter "Kendall").

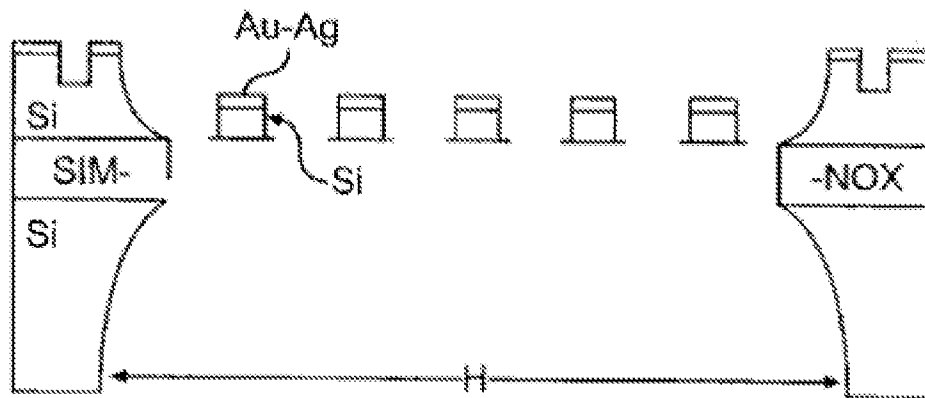
Regarding claims 1, 6-7, and 17, Kendall teaches a metal oxide semiconductor field effect transistor for gas and liquid testing comprising ("a fluid sensor for use in an environment having an ambient temperature") (col. 4 lines 20-24) comprising:

a) a field-effect transistor (FET) comprising a functionalized semiconductor nanowire (col. 12 lines 25-32), including at least one catalyst, the catalyst such as gold. The material capable of interacting with a fluid to be sensed and effecting a change of an electrical characteristic of the FET;

b) Kendall teaches the thin membranes may be heated and cooled in incredibly short times (Figure 12: "H"). Kendall therefore teaches an integral heater disposed proximate to the field-effect transistor to heat the field-effect transistor to an elevated temperature relative to the ambient temperature.

In the alternative Kendall teaches heating the thin membrane but is silent that the heater is integral. It would have been obvious to one of ordinary skill to place the heater integral to optimize the heat transfer and minimize heat loss.

c) integral thermal insulation SIM-NOX disposed to maintain the field-effect transistor at the elevated temperature.



**FIG. 12**

Regarding claim 2, Kendall teach the functionalized semiconductor nanowire comprises silicon (Figure 12)

Regarding claim 8-9, Kendall teach the metals are a porous gate layer ("catalyst comprises a porous thin layer of catalyst material" " pores of the porous thin layer of catalyst material extend at least partially through the thin layer of catalyst material") (col. 8 lines 52-66)

Regarding claim 10, Kendall teaches the nanowindows, which are nanogrooves that go all the way through the membrane. The thin membranes of the nanowires are made of the metals ("wherein the catalyst comprises a mesh formed by thin filaments of catalyst material") (col. 3 lines 60-67).

Regarding claim 13-16, Kendall teaches a substrate made of silicon on an insulator comprising silicon oxide that holds the MOSFET ("further comprising a substrate for supporting the field-effect transistor" "the substrate are formed from a layer

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of silicon on an insulator (SOI)” “wherein the integral thermal insulation is disposed on the substrate”) (col. 11 lines 10-34, Figure 12).

Regarding claim 17-18, Kendall teaches wherein the integral heater is disposed between the substrate Si and the insulator SIMNOX (Figure 12: H)

Regarding claims 19-20, Kendall teaches the field-effect transistor (FET) is disposed on the substrate and the thermal insulation (Figure 11 and 12)

Regarding claim 21, Kendall teaches wherein a portion of the substrate is removed to form an opening under the field-effect transistor (FET), the opening being at least partially aligned with the field-effect transistor (Figure 12)

Regarding claims 22-23, Kendall teaches the MOSFET (“field-effect transistor”) comprises a SIMNOX layer (broadly interpreted reads on “substrate” “includes a gate electrically insulated from the substrate”) (Figure 12: Si) which is fully capable of serving as a gate for the field-effect transistor.

Regarding claim 24, Kendall teach the gold-silver layer (“conductive catalyst”) on silicon (“functionalized semiconductor nano-wire”) is insulated from the substrate by SIMNOX layer which is fully capable of providing a gate for the field-effect transistor (Fig. 12).

Regarding claim 56, Kendall teach a metal oxide semiconductor field effect transistor for gas and liquid testing comprising (“a fluid sensor for use in an environment having an ambient temperature”) (col. 4 lines 20-24) a) a field-effect transistor (FET) comprising a functionalized semiconductor nanogroove (“nanowire”), including a coating 208 comprising silicon dioxide (“coating comprises at least one dielectric layer

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of an oxide or a nitride that can be protonated or deprotonated for the detection of protons” “integral thermal insulation disposed to maintain the field-effect transistor at the elevated temperature”); Kendall teaches the thin membranes may be heated and cooled in incredibly short times (Figure 12: “H”). Kendall therefore teaches an integral heater disposed proximate to the field-effect transistor to heat the field-effect transistor to an elevated temperature relative to the ambient temperature. In the alternative Kendall teaches heating the thin membrane but is silent that the heater is integral. It would have been obvious to one of ordinary skill to place the heater integral to optimize the heat transfer and minimize heat loss.

Regarding claim 58-59, Kendall teach the dielectric layer has a long chain molecule 210 such as DNA, RNA, or Polypeptides on its surface (“the coating comprises at least one organic species selected from the list consisting of antibodies, antigens, polymers, **polynucleic acids**, **polypeptides**, nanoparticles, ion exchange membranes, and combinations thereof” “wherein the coating comprises at least one substance selected from the list consisting of thiols, amines, silanols, alcohols, sugars, Lewis acids, Lewis bases, dipoles, **nucleic acids**, peptides, and combinations thereof”) (col. 4 lines 1-5).

6. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kendall in view of Stehlin et al (USP 3,897,274).

Regarding claim 3, Kendall teach the SIMNOX process for producing an oxide layer under a single crystal layer. Kendall is silent about the silicon in the functionalized semiconductor nano-wire is doped.

Stehlin et al teach a method of fabricating dielectrically isolated semiconductor structures wherein n-type silicon is used as the starting material to provide a suitable final insulating compound semiconductor (col. 6 line 45-50). It is well known to use doped silicon as starting material for semiconductor insulating layers.

It would have been obvious to one of ordinary skill in the art as motivated by Stehlin et al to dope the functionalized semiconductor nanowire because it is well known to provide doped dielectric layers as starting material in order to form a silicon over insulating substrate.

7. Claims 25-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kendall in view of Holm-Kennedy (USP 5,466,348).

Kendall teaches the limitations of claim 1 as per above.

Regarding claims 25-28, Kendall teaches a MOSFET device comprising a heater. Kendall is silent about the device further comprising at least one integral temperature sensor disposed proximate to the field-effect transistor for determining the temperature thereof and the device is an array, each fluid sensor of the fluid sensor array comprising the device.

Holm-Kennedy teach a device for biochemical sensing comprising a sensor such as a MOSFET sensor (col. 5 lines 5-25) that can be combined in arrays with same or differing receptors to provide rapid measurements (Abstract) and further comprising a temperature sensor to monitor incubation conditions present during the chemical reaction of interest (col. 16 lines 40-49). It is desirable to combine the MOSFET device with a temperature sensor in order to monitor the incubation temperature. It is desirable



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to combine the sensors in an array in order to detect several different target molecules to provide rapid measurements.

Therefore it would have been obvious to one of ordinary skill in the art as motivated by Holm-Kennedy to combine a temperature sensor in the Kendall device in order to monitor incubation conditions present during the chemical reaction of interest.

Therefore it would have been obvious to one of ordinary skill in the art as motivated by Holm-Kennedy to combine the device of Kendall/Holm-Kennedy into an array in order to detect several different target molecules to provide rapid measurements.

Regarding claim 29-31, Kendall/Holm-Kennedy teach the array comprises a long chain molecules 110 such as DNA, RNA, polypeptides, etc specific for binding large molecules 118. The arrays can have the same or differing receptors ("is functionalized for detecting a particular substance" "array is functionalized for detecting a distinct substance" "wherein the field-effect transistors of a number of the fluid sensors of the array are functionalized for detecting the same substance").

Regarding claim 32, Kendall/Holm-Kennedy teach the array further comprising at least one field-effect transistor 50F not functionalized for detecting a substance, whereby at least one calibration sensor ("control device") is provided (Figure 5: 50F, col. 16 lines 51-65)

### ***Response to Arguments***

8. Applicant's arguments with respect to claims 1-3, 6-10, 13-32, and 56-59, have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DENNIS M. WHITE whose telephone number is (571)270-3747. The examiner can normally be reached on Monday-Thursday, EST 8:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on (571) 272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Lyle A Alexander/  
Primary Examiner, Art Unit 1797

dmw